



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.05.2018 Bulletin 2018/22

(51) Int Cl.:
F25D 23/02 ^(2006.01) **E06B 3/70** ^(2006.01)

(21) Application number: **17201812.9**

(22) Date of filing: **15.11.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(71) Applicant: **BSH Hausgeräte GmbH**
81739 München (DE)

(72) Inventors:
• **Arslankiray, Ziya**
59860 TEKIRDAG (TR)
• **Engin, Ercan**
59510 TEKIRDAG (TR)
• **Yildizgöcer, Tanzer**
59850 TEKIRDAG (TR)

(30) Priority: **23.11.2016 US 201615360179**

(54) **HOME APPLIANCE DOOR**

(57) For the purpose of improving flexibility, a home appliance door, for example a home chiller appliance door, is proposed comprising: at least one base body and

at least one front cover element, the base body and the front cover element cooperating to form a door handle recess.

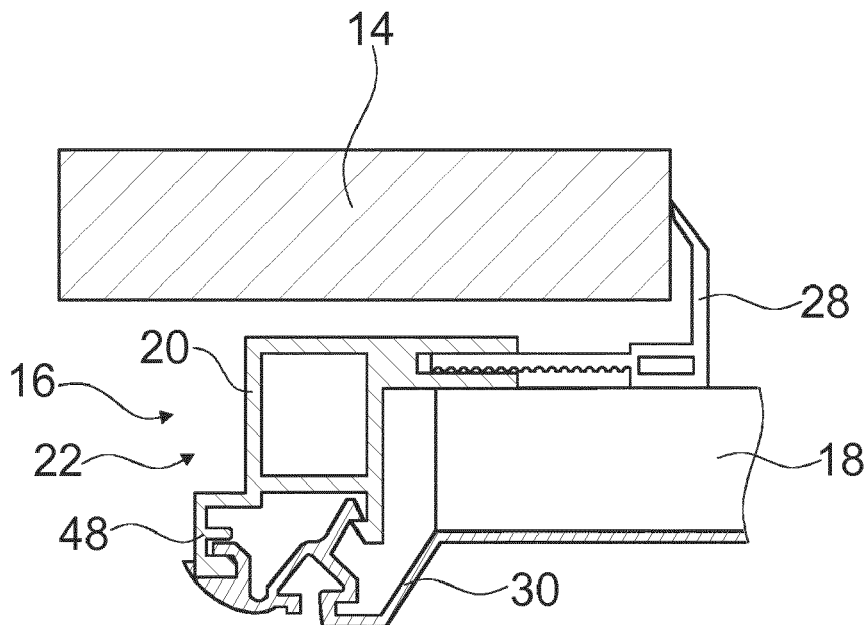


Fig. 4

Description

BACKGROUND OF THE INVENTION

[0001] The invention relates to a home appliance door, for example a home chiller appliance door, according to claim 1.

[0002] From the prior art, in particular the document DE 10 2006 018 424 A1, a home chiller appliance door comprising at least one base body and at least one front cover element is already known. However, in this case an additional door handle, which is implemented separately from the base body and the front cover element, is used for applying an opening force.

SUMMARY OF THE INVENTION

[0003] An object of the invention is to provide a home appliance door with improved characteristics regarding a flexibility. This object is achieved, according to the invention, by the features of claim 1, while further implementations and further developments of the invention may be gathered from the dependent claims.

[0004] A home appliance door, for example a home chiller appliance door, is proposed, comprising: at least one base body and at least one front cover element, the base body and the front cover element cooperating to form a door handle recess.

[0005] By means of the invention a flexibility of the home appliance door can be improved. For example, a design of the home appliance door may be improved. Furthermore, an improved stability of the home appliance door may be achieved. Thus, for example a fatigue strength and/or a durability of the home appliance door may be increased. In addition, an efficiency, for example a manufacturing efficiency, an installation space efficiency, a component efficiency and/or a cost efficiency, can be improved.

[0006] By a "home appliance door" is in particular to be understood at least a part and/or a portion, e.g. a sub-assembly group, of a home appliance which is in particular configured for closing and/or sealing off at least one storage space. The home appliance is in particular provided for storing and preferably tempering victuals such as beverages, meat, fish, vegetables, fruits, milk and/or dairy products in at least one operating state, advantageously for the purpose of enhancing a manageability of the stored victuals. For this purpose, the home appliance, in particular, comprises a housing which defines the at least one storage space. For example, the home appliance is embodied as a home chiller appliance, which is in at least one operating state configured for cooling victuals. The home chiller appliance could in particular be embodied as a climate cabinet, an ice-box, a refrigerator, a freezer, a refrigerator-freezer combination and/or a wine cooler. However, the home appliance could also be embodied as a home appliance for warming up and in particular for cooking victuals, e.g. an oven, a steamer

and/or a microwave. In this context, "configured" is in particular to mean specifically programmed, designed and/or equipped. By an object being configured for a certain function is in particular to be understood that the object implements and/or fulfills said certain function in at least one application state and/or operating state.

[0007] Moreover, the base body may define a main part of the home appliance door and may be configured for covering the storage space at least largely or completely. For this purpose, the base body may comprise at least one rear wall which, in particular, faces the storage space, at least one front wall which, in particular, faces away from the storage space, and/or at least one side wall which, in particular, connects the rear wall and the front wall. The rear wall and/or the front wall may define a main extension plane of the base body, which is at least substantially parallel to an, in particular horizontally oriented, base and/or ground. The side wall may be arranged at least substantially perpendicular to the main extension plane of the base body. In this context, a "main extension plane" of an object is, in particular, to be understood as a plane extending parallel to a largest side of an imaginary rectangular cuboid which only just entirely encloses the object and preferably extends through a geometric center of the object. Moreover, "at least substantially parallel" is in particular to be understood as an orientation of a direction with respect to a reference direction, in particular in a plane, wherein the direction and the reference direction include an angle of 0°, the orientation in particular having a deviation of less than 15°, advantageously of less than 10° and particularly advantageously of less than 2°. Furthermore, "at least substantially perpendicular" is in particular to mean an orientation of a direction with respect to a reference direction, in particular in a plane, wherein the direction and the reference direction include an angle of 90°, the orientation in particular having a deviation of less than 15°, advantageously of less than 10° and particularly advantageously of less than 2°. In addition, the term "at least largely" is to mean, in particular, at least 55 %, advantageously at least 65 %, preferably at least 75 %, more preferably at least 85 % and particularly advantageously at least 95 %.

[0008] The front cover element may be configured for covering the front wall of the base body at least partly and/or at least largely and/or completely. The front cover element may be implemented, in an assembled state, separately from the base body and connected to the base body, for example the front wall, e.g. in a form-fit, a force-fit and/or a bonded manner. The front cover element may be dimensionally stable. In particular, the front cover element may be implemented in multiple parts and/or integrally. For example, the front cover element is implemented as a furniture door and/or as a decorative panel and/or a decorative frame. "Implemented integrally" is in particular to mean, in this context, connected at least by substance-to-substance bond, e.g. by a welding process, an adhesive bonding, an injection-molding process

and/or by another process that is deemed expedient by a person having ordinary skill in the art. For example, "implemented integrally" could in particular mean made of one piece. "Made of one piece" is, in particular, to mean, in this context, manufactured from one single piece, e.g. by production from one single cast and/or by manufacturing in a one-component or multi-component injection-molding process, and advantageously from a single blank. The term "cooperating" is to be understood, in this context, in particular, as directly delimiting and/or forming. A "door handle recess" is in particular to be understood as a recess which directly forms at least a part and/or a portion of a door handle. For example, the door handle recess is configured for directly applying an opening force, in particular for opening the home appliance door. The home appliance door may in particular be free from a door handle protruding from the front wall in a direction away from the storage space.

[0009] In particular, for decreasing an opening force and/or increasing an ease of use, it is proposed that the door handle recess has a depth of at least 10 mm or at least 12.5 mm or at least 15 mm.

[0010] The door handle recess may be hidden and/or covered by the front cover element at least when viewed in a direction which is at least substantially perpendicular to a main extension plane of the base body and in particular a direction which is at least substantially perpendicular to the front wall. In this way, in particular, a manufacturing process and/or assembling process may be improved. Moreover, a design of the home appliance door may be improved.

[0011] The front cover element may be adjustable with respect to the base body and in particular movably connected to the base body, in particular for easily adjusting a position of the front cover element with respect to the base body. For this purpose, the home appliance door may comprise a, for example at least partly flexible, adjusting element which is in particular configured to adjust the front cover element with respect to the base body. A "flexible object" is in particular to mean an object which comprises at least one subpart and/or subregion which in a normal operating state is, for example elastically, changeable in its position by at least 0.25 mm or by at least 0.5 mm or by at least 1 mm or by at least 2 mm, and which may generate a counterforce acting counter to the change in position, wherein the counterforce is a function of the change and may be proportional to the change.

[0012] The base body may comprise at least one closure element, which in particular forms and/or defines the rear wall and/or the front wall of the base body, and at least one frame element which at least partly encompasses the closure element, the frame element in particular forming and/or defining the at least one side wall of the base body and/or at least a part and/or portion of the side wall of the base body. The closure element may be configured for covering the storage space at least largely or completely. Moreover, the closure element may be

implemented at least partly or at least largely or completely, of a transparent material, e.g. plastic and/or glass. The frame element may be implemented separately from the closure element and may be connected to the closure element in a form-fit, a force-fit and/or a bonded manner. The frame element may be implemented integrally. The frame element may be different from a mere coating and, in particular, configured to cover, hold, fasten and/or stabilize the closure element. For this purpose, the home appliance door may further comprise a, e.g. at least partly flexible, clamping element which may be configured to secure the closure element for example together with the frame element. In this way, in particular, a heat exchange can be controlled. Moreover, a manufacturing efficiency may be improved.

[0013] The frame element may cooperate with the front cover element to form the door handle recess. In this way, in particular an installation space efficiency and/or a component efficiency may be improved advantageously.

[0014] In addition, the frame element may comprise at least one setback for defining the door handle recess. A "setback" is, in particular, to be understood as a step-like recession and/or a stepped structure, for example comprising exactly one step, in particular if viewed in a direction which is at least substantially perpendicular to the front wall and may start from the front wall, for example from a front edge connecting the front wall and the side wall. Therefore, the frame element may comprise a stepped structure extending merely in one direction, in particular, such that the stepped structure continuously widens or continuously tapers. The frame element may further comprise at least one or exactly one, rear edge protrusion delimiting the setback. The rear edge protrusion may be arranged in close vicinity of the rear wall and/or of a rear edge connecting the rear wall and the side wall. In this context, "a close vicinity" is in particular to be understood as a spatial region which is formed by points having a distance from a reference point and/or a reference component which is less than 3 cm or less than 2 cm or less than 1 cm or less than 0.5 cm. In this way, in particular, sufficient space for the door handle recess may be created easily.

[0015] The frame element may be implemented at least partly, at least largely and/or completely of plastic. The frame element may also be implemented at least partly or at least largely or completely, of metal, for example steel and/or aluminum. By using steel and/or aluminum, a fatigue strength and/or a durability of the home appliance door may be improved.

[0016] The frame element may be implemented as a hollow profile. In this case, the frame element may comprise at least one inner cavity with an at least substantially circular and/or rectangular shape and/or cross section. By an "at least substantially circular and/or rectangular object", is to be understood in particular an object which differs from a circular and/or rectangular reference object by an area portion which is less than 20 %, advanta-

geously less than 15 % and in particular advantageously less than 10 %. In this way, in particular, cost efficiency and/or material efficiency may be improved.

[0017] Also the frame element may be implemented as a side cover element for example for covering a side of the closure element and in particular installation parts of the base body and/or of the closure element. In this way, in particular a design of the home appliance door can be improved. Moreover, the base body can be protected from dirt and/or dust.

[0018] Furthermore, the frame element may have at least one holding section for holding at least one adjusting element, in particular the aforementioned adjusting element, which is configured to adjust a position of the front cover element with respect to the base body. The adjusting element may be in an assembled state implemented separately from the frame element and connected to the frame element, for example in a form-fit, a force-fit and/or a bonded manner. In this way, a particularly flexible home appliance door may be obtained. Moreover, an appearance of the home appliance door may be individually adapted.

[0019] Moreover, the frame element may have at least one further holding section for holding at least one clamping element, for example the aforementioned clamping element, which is configured to secure the closure element. The holding section and the further holding section may be arranged at least substantially perpendicular to each other. The clamping element may be implemented separately from the frame element and connected to the frame element in an assembled state, for example in a form-fit, a force-fit and/or a bonded manner. In this way, a particularly flexible home appliance door with an improved installation space efficiency and/or component efficiency may be obtained.

[0020] Herein the home appliance door is not to be limited to the application and implementation described above. In particular, for the purpose of fulfilling a functionality herein described, the home appliance door may comprise a number of respective elements, structural components and units that differs from the number mentioned herein. Furthermore, regarding the value ranges mentioned in this disclosure, values within the limits mentioned are to be understood to be also disclosed and to be used as applicable.

[0021] Further advantages may become apparent from the following description of the drawing. In the drawing an exemplary embodiment of the invention is shown. The drawing, the description and the claims contain a plurality of features in combination. The person having ordinary skill in the art will purposefully also consider the features separately and will find further expedient combinations.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0022]

Fig. 1 a home appliance comprising a housing and a home appliance door with a base body and a front cover element in an unassembled state, in a schematic front view,

Fig. 2 the home appliance door, in a perspective bottom view,

Fig. 3 a portion of the home appliance door showing a side wall of the base body, in a detailed view,

Fig. 4 the portion of the home appliance door showing the side wall of the base body, in a schematic view, and

Fig. 5 a frame element of the base body, in a detailed view.

DETAILED DESCRIPTION OF THE INVENTION

[0023] Fig. 1 shows a perspective view of an exemplary home appliance 32. In the present case, the home appliance 32 is implemented as a home chiller appliance, in particular as a wine cooler. Alternatively, a home appliance could be embodied as any other kind of home chiller appliance, like a refrigerator, a freezer and/or a refrigerator-freezer combination. In addition, a home appliance could also be embodied as a home appliance for warming up and in particular for cooking victuals, e.g. an oven, a steamer and/or a microwave.

[0024] The home appliance 32 is configured for cooling victuals. For this purpose, the home appliance 32 comprises a housing 34. The housing 34 defines a storage space 36, in particular for storing and tempering the victuals.

[0025] The home appliance 32 further comprises a home appliance door 10. The home appliance door 10 is movably connected to the housing 34. In the present case, the home appliance door 10 is pivotally connected to the housing 34. The home appliance door 10 is pivotable about a pivot axis 38 which is perpendicular to a base, a ground and/or a floor space of the home appliance 32. In a closed state, the home appliance door 10 closes off and seals off the housing 34 in particular the storage space 36. Alternatively, a home appliance door could be pivotable about a pivot axis which is parallel to a base, a ground and/or a floor space of a home appliance. Moreover, a home appliance door may be connected to a housing in a linearly movable manner and/or in a push-pull manner.

[0026] Figs. 2 to 4 show the home appliance door 10 in different views from the bottom. The home appliance door 10 comprises a base body 12. The base body 12 defines a main part of the home appliance door 10. The base body 12 is configured for covering the storage space 36 completely.

[0027] For this purpose, the base body 12 comprises a closure element 18. The closure element 18 is plate-

shaped. The closure element 18 is implemented of a transparent material, in the present case in particular glass. The closure element 18 defines and/or forms a rear wall 40 and a front wall 42 of the base body 12. The rear wall 40 faces the storage space 36. The front wall 42 faces away from the storage space 36. The front wall 42 is parallel to the rear wall 40. The rear wall 40 and the front wall 42 define a main extension plane of the base body 12. The main extension plane of the base body 12 is at least substantially parallel to the base, the ground and/or the floor space of the home appliance 32.

[0028] In addition, the base body 12 comprises at least one frame element 20. The frame element 20 is implemented separately from the closure element 18. The frame element 20 is implemented integrally. The frame element 20 is implemented as a hollow profile and comprises an inner cavity with a rectangular cross section (see figure 5). The frame element 20 is implemented of metal, in the present case in particular aluminum. The frame element 20 encompasses the closure element 18 at least partly. In an assembled state, the frame element 20 contacts the closure element 18. The frame element 20 defines and/or forms a side wall 44 of the base body 12, in the present case in particular a lateral side wall having a longitudinal extension which is at least substantially parallel to the pivot axis 38 and/or at least substantially perpendicular to the base, the ground and/or the floor space of the home appliance 32. The frame element 20 is arranged opposite the pivot axis 38. The frame element 20 extends over the whole longitudinal extension of the closure element 18. Moreover, the frame element 20 is implemented as a side cover element for covering a side of the closure element 18 and in particular installation parts of the base body 12. For completely encompassing the closure element 18, the base body 12 comprises three further frame elements 46, which are arranged on different sides of the closure element 18 with respect to the frame element 20. Alternatively, a frame element and further frame elements may be implemented integrally.

[0029] In addition, the home appliance door 10 comprises at least one front cover element 14. In the present case, the home appliance door 10 comprises exactly one front cover element 14. The front cover element 14 is implemented separately from the base body 12. The front cover element 14 is connected to the base body 12 in an assembled state. In the present case, the front cover element 14 is connected to the base body 12 in a form-fit and/or force-fit manner. The front cover element 14 is connected to the base body 12 in such a manner that the front cover element 14 is adjustable and/or movable with respect to the base body 12. Moreover, the front cover element 14 is arranged above the front wall 42 in particular in such a manner that the front wall 42 is partly covered by the front cover element 14. In the present case, the front cover element 14 covers at least the frame element 20 and in particular the further frame elements 46 at least when viewed in a direction which is at least sub-

stantially perpendicular to the front wall 42. In the present case, the front cover element 14 is implemented as a frame, in particular a decorative frame. Alternatively, a front cover element may be connected to a base body in a bonded manner. Moreover, a front cover element may be implemented as a decorative panel and/or a furniture door. In addition, a front cover element could cover a front wall completely.

[0030] The base body 12 and the front cover element 14 cooperate to form a door handle recess 16. In the present case, the frame element 20 cooperates with the front cover element 14 to form the door handle recess 16. Thus the frame element 20 and the front cover element 14 delimit the door handle recess 16. The door handle recess 16 has a depth of at least 15 mm. The door handle recess 16 is covered by and/or hidden by the front cover element 14 at least when viewed in a direction which is at least substantially perpendicular to the main extension plane of the base body 12 and/or to the front wall 42. The door handle recess 16 directly forms a door handle. The door handle recess 16 is configured for applying an opening force, in particular for uncovering the storage space 36.

[0031] For this purpose, the frame element 20 comprises at least one setback 22 (see figures 4 and 5). In the present case, the frame element 20 comprises exactly one setback 22. The setback 22 corresponds to a step-like recession. The setback 22 starts from the front wall 42 and extends towards the rear wall 40. The setback 22 extends over at least 55 %, preferably at least 65 %, more preferably at least 75 % and most preferably at least 85 % of the frame element 20 in a direction from the front wall 42 to the rear wall 40. The setback 22 delimits and in the present case in particular creates space for the door handle recess 16.

[0032] Moreover, the frame element 20 comprises at least one rear edge protrusion 48. In the present case, the frame element 20 comprises exactly one rear edge protrusion 48. The rear edge protrusion 48 is arranged in close vicinity of a rear edge connecting the rear wall 40 and the side wall 44. The rear edge protrusion 48 protrudes in a direction which is parallel to the main extension plane of the base body 12. In the present case, the rear edge protrusion 48 protrudes in a direction which is perpendicular to the pivot axis 38. The rear edge protrusion 48 delimits the setback 22. Moreover, the rear edge protrusion 48 delimits the door handle recess 16. Alternatively, a frame element may comprise at least two, at least three and/or at least four setbacks, and/or at least two, at least three and/or at least four protrusions. Moreover, it is conceivable to apply an additional coating to a door handle recess in particular to improve a durability and/or haptic features of the door handle recess.

[0033] In addition, the frame element 20 comprises at least one holding section 24, 26 (see figures 4 and 5). In the present case, the frame element 20 comprises two holding sections 24, 26. The holding sections 24, 26 are arranged at least substantially perpendicularly to each

other.

[0034] A first holding section 24 of the holding sections 24, 26 is arranged in close vicinity of the front cover element 14. The first holding section 24 is arranged at least largely between the front cover element 14 and the closure element 18. The first holding section 24 is configured for holding an adjusting element 28 of the home appliance door 10. The adjusting element 28 is at least partly flexible. The adjusting element 28 contacts an inner wall of the front cover element 14 which is at least substantially perpendicular to the main extension plane of the base body 12. The adjusting element 28 is configured to adjust the front cover element 14 with respect to the base body 12. A functional principle of the adjusting element 28 is explicitly disclosed in the document DE 10 2006 018 424 A1 the disclosure of which is herein incorporated by reference.

[0035] A second holding section 26 of the holding sections 24, 26 is arranged in close vicinity of the rear wall 40. The second holding section 26 is configured for holding a clamping element 30 of the home appliance door 10. The clamping element 30 is at least partly flexible. The clamping element 30 contacts an inner wall of the closure element 18 and/or the rear wall 40. The clamping element 30 is configured to secure the closure element 18. In the present case, the clamping element 30 and the frame element 20 are configured to clamp the closure element 18. A functional principle of the clamping element is explicitly disclosed in the document DE 10 2006 018 424 A1, the disclosure of which is herein incorporated by reference.

[0036] The following is a summary list of reference numerals and the corresponding structure used in the above description of the invention:

10	home appliance door
12	base body
14	front cover element
16	door handle recess
18	closure element
20	frame element
22	setback
24	holding section
26	holding section
28	adjusting element
30	clamping element
32	home appliance
34	housing
36	storage space
38	pivot axis
40	rear wall
42	front wall
44	side wall
46	frame element
48	rear edge protrusion

Claims

1. A home appliance door, for example a home chiller appliance door, comprising: at least one base body and at least one front cover element, the base body and the front cover element cooperating to form a door handle recess.
2. The home appliance door according to claim 1, the door handle recess having a depth of at least 10 mm.
3. The home appliance door according to claim 1, the door handle recess being hidden by the front cover element at least when viewed in a direction which is at least substantially perpendicular to a main extension plane of the base body.
4. The home appliance door according to claim 1, the front cover element being adjustable with respect to the base body.
5. The home appliance door according to claim 1, the base body comprising at least one closure element and at least one frame element which at least partly encompasses the closure element.
6. The home appliance door according to claim 5, the frame element cooperating with the front cover element to form the door handle recess.
7. The home appliance door according to claim 5, the frame element comprising at least one setback for defining the door handle recess.
8. The home appliance door according to claim 5, the frame element being implemented at least partly of metal.
9. The home appliance door according to claim 5, the frame element being implemented as a hollow profile.
10. The home appliance door according to claim 5, the frame element being implemented as a side cover element.
11. The home appliance door according to claim 5, the frame element having at least one holding section for holding at least one adjusting element which is configured to adjust a position of the front cover element with respect to the base body.
12. The home appliance door according to claim 5, the frame element having at least one further holding section for holding at least one clamping element which is configured to secure the closure element.
13. A home appliance, for example a home chiller appli-

ance, comprising a housing which defines at least one storage space, and at least one home appliance door according to any one of claims 1 to 12, configured for closing the storage space.

5

10

15

20

25

30

35

40

45

50

55

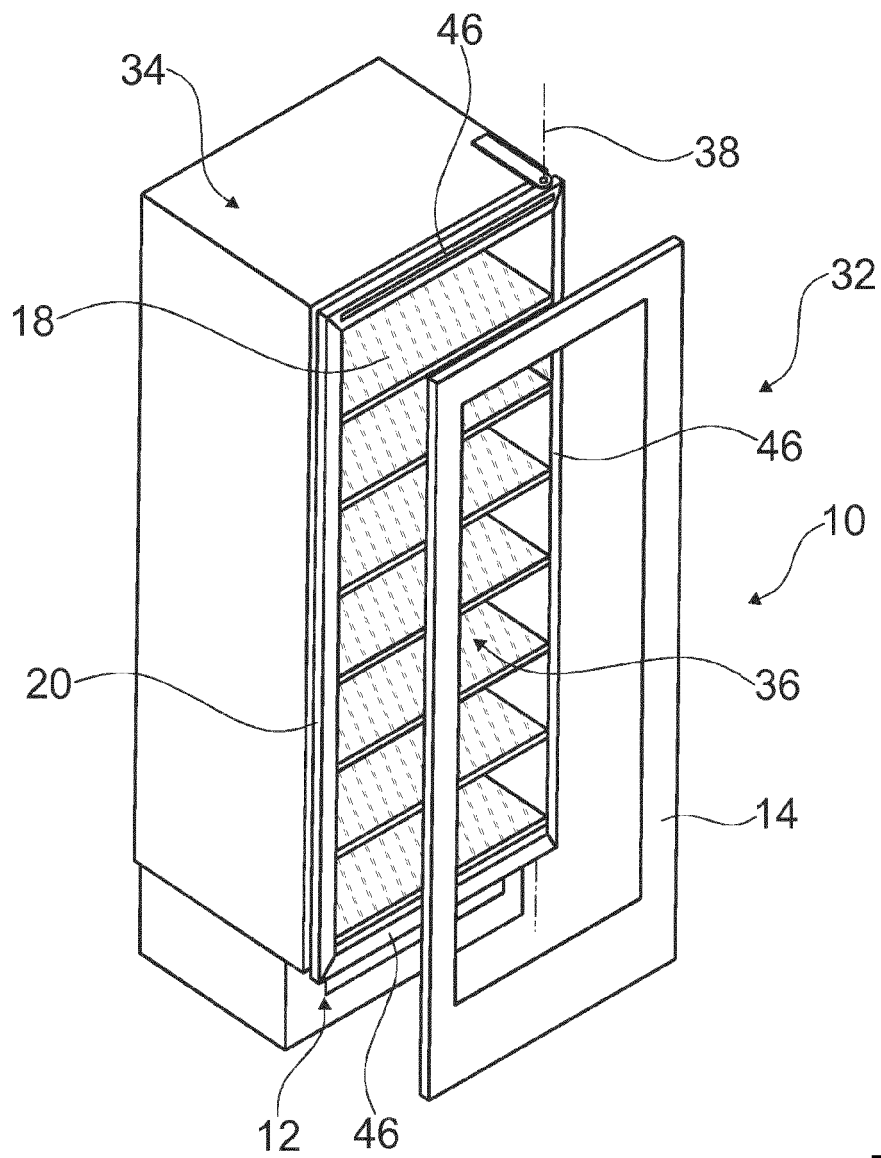


Fig. 1

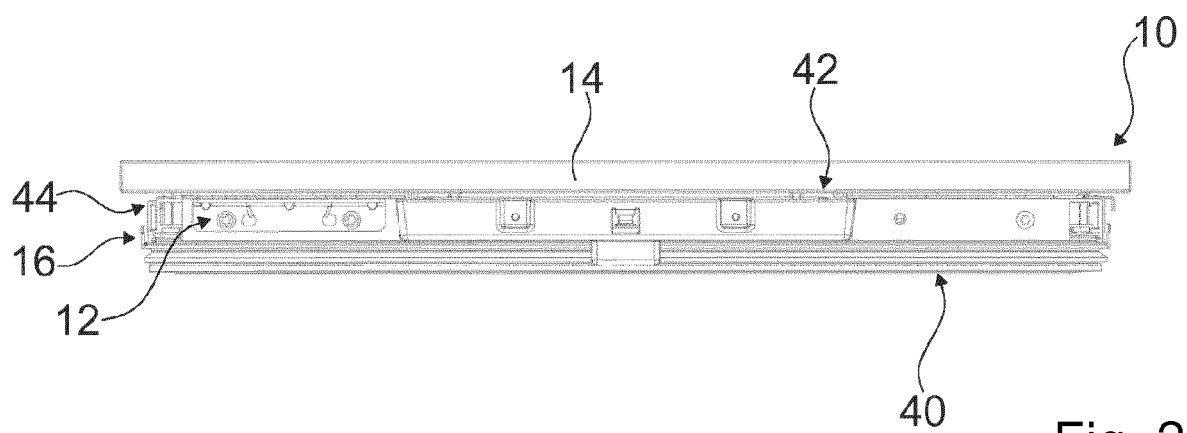


Fig. 2

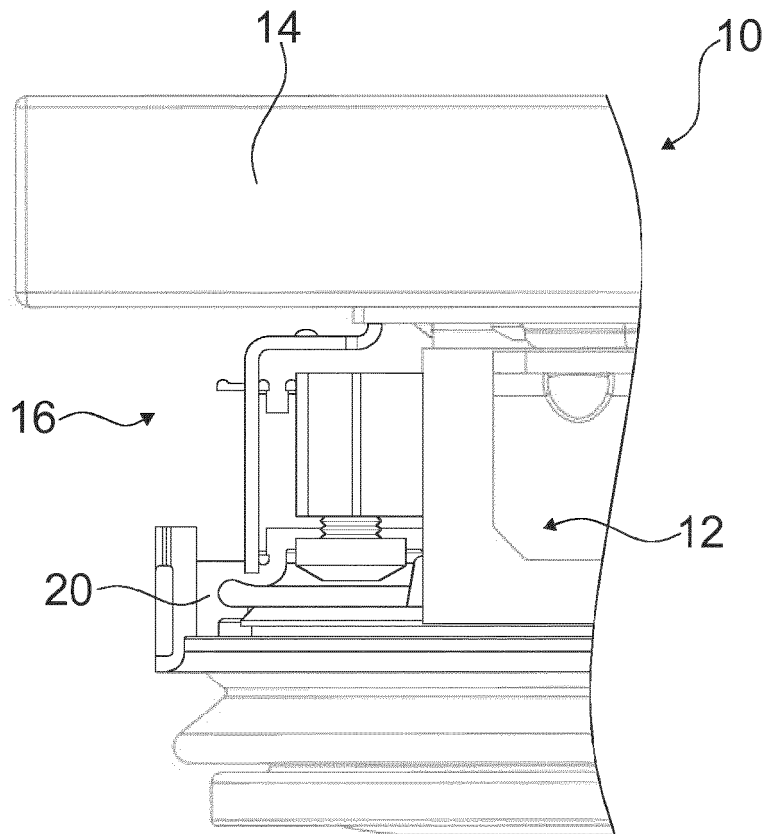


Fig. 3

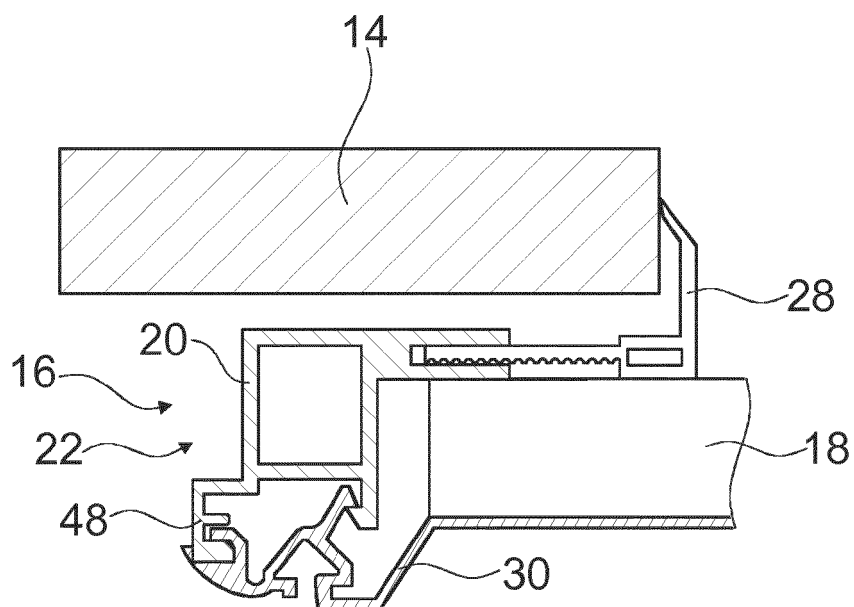


Fig. 4

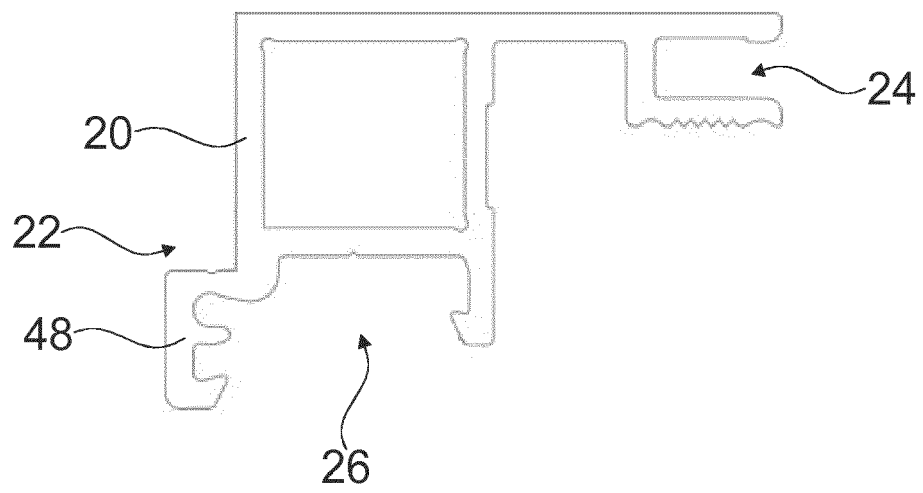


Fig. 5



EUROPEAN SEARCH REPORT

 Application Number
 EP 17 20 1812

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2012 200813 A1 (BSH BOSCH SIEMENS HAUSGERÄTE [DE]) 25 July 2013 (2013-07-25) * abstract; figures 1, 2, 7 * * paragraph [0030] * -----	1,3,5-8, 10,13	INV. F25D23/02 E06B3/70
X	DE 10 2006 018424 A1 (BSH BOSCH SIEMENS HAUSGERÄTE [DE]) 25 October 2007 (2007-10-25) * abstract; figures 1, 3 * -----	1,3-11, 13	
Y		12	
X	CN 104 075 528 A (HITACHI APPLIANCES INC) 1 October 2014 (2014-10-01) * abstract; figures 1, 5-6c * * paragraph [0041] * -----	1-3,13	
X	JP 2003 247774 A (HITACHI LTD) 5 September 2003 (2003-09-05) * abstract; figures 11, 12 * * paragraphs [0043] - [0048] * -----	1,3,5-7, 10,13	
Y	JP S60 159983 U (NOT KNOWN) 24 October 1985 (1985-10-24) * figures 1-3 * -----	12	TECHNICAL FIELDS SEARCHED (IPC)
A		1	F25D E06B
X	WO 2016/031534 A1 (MITSUBISHI ELECTRIC CORP [JP]) 3 March 2016 (2016-03-03) * the whole document * -----	1	
X	KR 2007 0008823 A (LG ELECTRONICS INC [KR]) 18 January 2007 (2007-01-18) * the whole document * -----	1	
X	JP S51 147362 U (NOT KNOWN) 26 November 1976 (1976-11-26) * the whole document * -----	1	
	-/--		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 March 2018	Examiner Bejaoui, Amin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 17 20 1812

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2016 169928 A (MITSUBISHI ELECTRIC CORP) 23 September 2016 (2016-09-23) * the whole document * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 March 2018	Examiner Bejaoui, Amin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 20 1812

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-03-2018

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102012200813 A1	25-07-2013	DE 102012200813 A1	25-07-2013
		WO 2013107605 A2	25-07-2013
DE 102006018424 A1	25-10-2007	CN 101426407 A	06-05-2009
		DE 102006018424 A1	25-10-2007
		EP 2010031 A1	07-01-2009
		US 2009084128 A1	02-04-2009
		WO 2007122081 A1	01-11-2007
CN 104075528 A	01-10-2014	CN 104075528 A	01-10-2014
		JP 6134554 B2	24-05-2017
		JP 2014194308 A	09-10-2014
JP 2003247774 A	05-09-2003	JP 3944530 B2	11-07-2007
		JP 2003247774 A	05-09-2003
JP S60159983 U	24-10-1985	NONE	
WO 2016031534 A1	03-03-2016	AU 2015307547 A1	23-03-2017
		CN 105387676 A	09-03-2016
		HK 1221007 A1	19-05-2017
		JP 6203149 B2	27-09-2017
		JP 2016048124 A	07-04-2016
		SG 11201700840V A	30-03-2017
		TW 201621244 A	16-06-2016
		WO 2016031534 A1	03-03-2016
KR 20070008823 A	18-01-2007	NONE	
JP S51147362 U	26-11-1976	NONE	
JP 2016169928 A	23-09-2016	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 102006018424 A1 [0002] [0034] [0035]